

2021 Quarterly Services Survey Technical Documentation

INTRODUCTION

The U.S. Census Bureau conducts the Quarterly Services Survey (QSS) to provide national estimates of quarterly revenue and expenses for employer establishments located in the United States and classified in select service sectors. (See the Coverage section below for more information on the industries included in the Quarterly Services Survey.)

Questionnaires are mailed to a probability sample of firms selected from the larger Service Annual Survey (SAS) sample. The sample includes firms of all sizes; however, firms without paid employees (nonemployers) are not included in the estimates.

COVERAGE

The estimates in this report are summarized by industry classification based on the 2012 North American Industry Classification System (NAICS).

NAICS groups establishments into industries based on the activities in which they are primarily engaged. This system, developed jointly by the statistical agencies of Canada, Mexico, and the United States, allows for comparisons of business activity across North America.

Detailed information about NAICS can be found [here](#).

In addition to a total selected services figure, estimates are presented for selected industries in the following NAICS sectors (2-digit NAICS codes) and subsectors (3-digit NAICS codes):

NAICS Sector/Subsector	Kind of Business	First Published Quarter
51	Information	2003, Q4
622	Hospitals	2004, Q4
623	Nursing and residential care facilities	
54*	Professional, scientific, and technical services	2006, Q3
56*	Administrative and support and waste management and remediation services	
484, 492, 493	Transportation (pt) and warehousing	2009, Q1
532	Rental and leasing services	
621	Ambulatory health care services	
624	Social assistance	
71	Arts, entertainment, and recreation	

81	Other services (except public administration)	
52	Finance and insurance	2009, Q3
22	Utilities	2010, Q1
481,483,485, 486,487,488	Selected industries in transportation	
533	Lessors of nonfinancial intangible assets (except copyrighted works)	
61	Educational services	
531	Real Estate	2012, Q3
721	Accommodation	

* For NAICS sectors 54 and 56, sector totals excluding certain industries were published starting with the fourth quarter of 2003. Since the third quarter of 2006, these sector totals have been published without exclusions.

SURVEY QUESTIONNAIRES

The Quarterly Services Survey questionnaires can be found [here](#).

DOLLAR VALUES

All dollar values presented in this report are expressed in current dollars; that is, the estimates are not adjusted to a constant dollar series. Consequently, when comparing estimates, users also should consider price level changes.

CONFIDENTIALITY

The U.S. Census Bureau is required by Section 9 of Title 13 United States Code to keep respondents' information confidential and can use the information only to produce statistics. The Census Bureau is not permitted to publicly release a respondent's information in a way that could identify a business, organization, or institution. Per the Federal Cybersecurity Enhancement Act of 2015, submitted data are protected from cybersecurity risks through screening of the systems that transmit the data.

DISCLOSURE AVOIDANCE

Disclosure is the release of data that reveals information or permits deduction of information about a particular survey unit through the release of either tables or microdata. Disclosure avoidance is the process used to protect each survey unit's identity and data from disclosure. Using disclosure avoidance procedures, the Census Bureau modifies or removes the

characteristics that put information at risk of disclosure. Although it may appear that a table shows information about a specific survey unit, the Census Bureau has taken steps to disguise or suppress a unit's data that may be "at risk" of disclosure while making sure the results are still useful. The Census Bureau has reviewed the data product for unauthorized disclosure of confidential information and has approved the disclosure avoidance practices applied. (Approval ID: CBDRB-FY22-003)

METHOD OF ASSIGNING TAX STATUS

For kind-of-business classifications where there are substantial numbers of taxable and tax-exempt establishments, establishments are classified based on the federal income tax filing requirement for the establishment or organization. This classification was based primarily on the response to an inquiry on the 2012 Economic Census questionnaire. Establishments that indicated that all or part of their income was exempt from federal income tax under provisions of section 501 of the Internal Revenue Service (IRS) code are classified as tax-exempt; establishments indicating no such exemption are classified as taxable. All government-operated hospitals are classified as tax-exempt.

For establishments without a report form, the tax status classification was based upon administrative data from other federal agencies. For selected industries that are comprised primarily of tax-exempt establishments, all establishments in those classifications are treated as tax-exempt. All establishments in the remaining industries (comprised primarily of taxable establishments) are treated as taxable.

SAMPLE DESIGN AND ESTIMATION PROCEDURES

The current sample was introduced in the third quarter of 2017 for the Quarterly Services Survey. The current sample was designed to produce estimates based on the 2012 North American Industry Classification System (NAICS). This section describes the design, selection, and estimation procedures for the current sample. For descriptions of prior samples, see the [*Quarterly Services Survey publications*](#).

Sampling Frame

The Quarterly Services Survey sample is a subsample of the Service Annual Survey sample and has the same types of sampling units as the Service Annual Survey frame—single establishment firms and multiple-establishment firms. Sampling units represent clusters of one or more establishments owned or controlled by the same firm. The sample is redrawn approximately every 5 years to redistribute reporting burden and to introduce sampling and processing efficiencies.

Stratification, Sampling Rates, and Allocation

The primary stratification of the Quarterly Services Survey frame is by industry group based on the detail required for publication. We publish Quarterly Services Survey estimates for less detailed industry groupings than for Service Annual Survey estimates. Therefore, the industry

stratification for the Quarterly Services Survey sample is broader than the industry stratification used for the Service Annual Survey sample. We assign each sampling unit to the industry stratum corresponding to the industry that contributes the most to the unit's sampling measure of size (i.e., annual revenue).

Within each industry stratum, we substratify the sampling units by a measure of size related to their annual revenue. We select sampling units expected to have a large effect on the precision of the estimates "with certainty." This means they are sure to be selected and will represent only themselves (i.e., have a selection probability of 1 and a sampling weight of 1). To identify the certainty units, we determine a substratum boundary (or cutoff) that divides the certainty units from the noncertainty units. We base these cutoffs on a statistical analysis of data extracted from the Census Bureau's Business Register. We also use this analysis to determine the number and boundaries of noncertainty substrata for each industry group and to set sampling rates needed to achieve specified sampling variability constraints on revenue estimates for different industry groups.

Sample Selection

We select the Quarterly Services Survey sample independently within each size substratum contained in an industry stratum. The actual selection procedure follows a systematic, probability proportional-to-size scheme. Because the Quarterly Services Survey sample is an independently selected subsample, it is possible that we select some units in the Service Annual Survey sample at a lower sampling rate than desired for the Quarterly Services Survey sample. We include such a unit in the Quarterly Services Survey sample with the Service Annual Survey sampling weight. The maximum sampling weight for a unit selected for the Quarterly Services Survey sample is 750.

Accommodation Subsector (NAICS 721)

For Accommodation (NAICS 721), the same sampling frame, stratification and allocation methodology described above is used for NAICS 721. For sample selection, all sampling units in NAICS 721 identified as certainty units are included in both the Quarterly Services Survey and the Service Annual Survey. Within each noncertainty stratum, a simple random sample of EINs are selected to be in the Service Annual Survey. These selected noncertainties are systematically split into two equal groups. One group is canvassed for both the Quarterly Services Survey and the Service Annual Survey, the other group is canvassed for only the Service Annual Survey.

Sample Maintenance

We update the QSS sample on a quarterly basis to represent EINs issued since the initial sample selection. These new EINs, called births, are EINs, recently assigned by the Internal Revenue Services (IRS), that have an active payroll filing requirement on the IRS Business Master File (BMF). An active payroll filing requirement indicates that the EIN is required to file payroll for the next quarterly period. The Social Security Administration attempts to assign industry classification to each new EIN.

EINs with an active payroll filing requirement on the IRS Business Master File are said to be “BMF active” and EINs with an inactive payroll filing requirement are said to be “BMF inactive.”

We sample EIN births on a quarterly basis using a two-phase selection procedure. To be eligible for selection, a birth must either have no industry classification or be classified in an industry within the scope of the Service Annual Survey (SAS), the Annual Wholesale Trade Survey (AWTS), or the Annual Retail Trade Survey (ARTS), and it must meet certain criteria regarding its quarterly payroll. In the first phase, we stratify births by broad industry groups and a measure of size based on quarterly payroll. A relatively large sample is drawn and canvassed to obtain a more reliable measure of size, consisting of revenue in two recent months and a new or more detailed industry classification code. Births that have not returned their questionnaire after 30 days are contacted by telephone.

Using this more reliable information, in the second phase we subject the selected births from the first phase to probability proportional-to-size sampling with overall probabilities equivalent to those used in drawing the initial Quarterly Services Survey sample from the December 2015 Business Register. The births selected for the Quarterly Services Survey sample are a subsample of the births selected for the Service Annual Survey sample. Because of the time it takes for a new employer firm to acquire an EIN from the IRS and because of the time needed to accomplish the two-phase birth-selection procedure, we add births to the sample approximately nine months after they begin operation.

If a firm was selected with certainty and had more than one establishment at the time of sampling, any new establishments that the firm acquires, even if under new or different EINs, are included in the sample with certainty.

However, if a firm was selected with certainty and had only one establishment at the time of sampling, only future establishments associated with that firm’s originally-selected EIN are included in the sample with certainty; any new EINs that might later be associated with that firm are subjected to sampling through the quarterly birth-selection procedure.

To be eligible for the sample canvass and tabulation, a single establishment EIN, or at least one EIN associated with a firm selected in the noncertainty sampling operations must meet both of the following requirements:

- It must be on the active payroll filing requirement on the IRS BMF.
- It must have been selected from the Business Register in either the initial sampling or during the quarterly birth-selection procedure.

Any new establishments that a firm acquires, even if under new or different EINs, may be added to the sample as part of the initial sampling unit’s representation, i.e., with the same initial sampling weight. For noncertainty firms, additional evaluation may be done in some instances to determine the feasibility of adding the new establishments by evaluating the effect of the new establishments on the industry estimates.

Each quarter, we check against the current Business Register to determine if any EINs on the Quarterly Services Survey have become BMF inactive. Typically, we do not canvass BMF inactive EINs during the reference quarter. Likewise, if any EIN on QSS that was BMF inactive in a previous reference quarter is now BMF active on the current Business Register, we again include these EINs in the canvass. In both cases, we only tabulate data for that portion of the reference quarter that these EINs report payroll to the IRS.

In some instances, single-unit EINs selected into the sample with certainty that are no longer BMF active may be dropped from canvass and tabulations. If the firm that used the EIN is found to have a successor EIN, then it is added to the survey. For both active EINs and any previously inactive EINs that are now active, data are tabulated for only the portion of the reference quarter that these EINs reported payroll to the IRS.

Note: Due to the COVID-19 pandemic, all quarterly sample maintenance processes were suspended for the second quarter of 2020. This allowed for the possibility that some BMF inactive EINs and inactive firms were still canvassed during that time. Additionally, births that would have been added to the survey during that time were identified in the following quarter's quarterly sample maintenance processing.

Estimation Method

[Horvitz-Thompson](#) estimates for each quarter are computed as the sum of weighted data (reported or imputed), where the weight for each unit is the reciprocal of the probability of selection of the unit into the QSS sample. The Horvitz-Thompson estimates are input into the benchmarking procedure to produce the published estimates, as described in the Quarterly Revenue Estimates section below.

BENCHMARKING

The Census Bureau revises the previously published quarterly estimates in a process called benchmarking. Benchmarking revisions are applied in the fourth quarter of each sample year. Previously published quarterly estimates are revised through benchmarking to:

- Reflect historical corrections to data for the current QSS and SAS samples. (Note: Subsector 721 was collected in ARTS in prior samples.)
- Introduce results of the most recently published SAS.
- Link the previously published estimates from the prior QSS sample to estimates from the current QSS sample.
- Incorporate updates to the seasonal adjustment models and parameters to reflect the revised estimates.

The remainder of this section describes the process used to produce the revised estimates.

See the [SAS Technical Documentation](#) for a description of how the SAS estimates are derived.
See the [ARTS Methodology](#) for a description of how the ARTS estimates are derived.

Quarterly Revenue, Expense and Inpatient Days Estimates

First, corrections were made to data obtained from the current QSS sample for the first quarter of 2017 through the third quarter of 2021. Corrections were made to replace previously reported data with more accurate data received at a later date or to replace data that has been previously imputed with reported data obtained from the company.

Next, the revenue, expense and inpatient day estimates through the first quarter of 2017 from any earlier samples were linked to the estimates from current sample starting with the second quarter of 2017. This is possible because two quarters of data, the first and second quarters of 2017, were collected under both samples. The linkage is performed at each detailed NAICS level (including separate breakouts by tax status, where applicable) by multiplying the Horvitz-Thompson estimates from the prior sample by a geometric mean. The geometric mean is computed as the square root of the product of two ratios. The numerators of the ratios are the Horvitz-Thompson estimates for first and second quarter 2017 from the current sample. The denominators of the ratios are the Horvitz-Thompson estimates for first and second quarter 2017 from the prior sample.

After performing the above linkage, the resulting estimates for the fourth quarter of 2003 through the fourth quarter of 2021 were input to the benchmarking program. The benchmarking process revised the estimates for a given detailed NAICS level in a manner that:

- For all QSS NAICS sectors, except NAICS subsectors 521 and 721, constrained the sum of the four quarterly revenue and expense (where collected) estimates for each year to equal the corresponding census-adjusted, annual estimate for employers obtained from SAS for 2013 through 2020 and left estimates for the fourth quarter of 2012 unchanged. Note that this, in turn, left all quarters prior to the fourth quarter of 2012 unchanged as well.
- For NAICS 521, constrained the sum of the four quarterly revenue estimates for 2013 and 2014 from QSS to equal the corresponding census-adjusted, annual revenue estimate obtained from SAS and left estimates for the fourth quarter of 2012 and all prior quarters unchanged. Quarterly estimates for first quarter of 2015 and subsequent quarters were not revised.
- For NAICS 721, constrained the sum of the four quarterly revenue estimates for 2013 through 2020 from QSS to equal the corresponding census-adjusted, annual revenue estimate for employers obtained from SAS (2015 through 2020) and ARTS (2013 and 2014).
- For NAICS 622, constrained the sum of the four quarterly inpatient day estimates for 2015 through 2020 from QSS to equal the corresponding annual inpatient days estimate for employers obtained from SAS.
- Minimized the sum of the squared differences between the quarter-to-quarter changes of the input and revised quarterly revenue and expense estimates.

A carry-forward factor was then applied to all subsequent quarterly estimates computed after the last benchmarked quarter, i.e., fourth quarter of 2020, to derive published quarterly revenue, expense and inpatient day estimates. The carry-forward factor is defined as the ratio of the benchmarked to pre-benchmarked estimate for the last quarter of the last benchmark year, in this instance, fourth quarter of 2020. Carry-forward factors are computed for each detailed NAICS level. The carry-forward factor remains the same until the next benchmarking operation.

Likewise, a carry-backward factor was used to derive published quarterly revenue and inpatient day estimates for quarters that precede the earliest annual constraint. The carry-backward factor for a given detailed NAICS level is the ratio of the benchmarked to pre-benchmarked estimate for the first quarter of the first benchmark year. In the current sample, there were two examples of this.

- In subsector 721, the revenue estimates for the third and fourth quarters of 2012 were multiplied by the benchmarked to pre-benchmarked ratio for the first quarter of 2013.
- In subsector 622, the inpatient day estimates through fourth quarter of 2014 were multiplied by the benchmarked to pre-benchmarked ratio for the first quarter of 2015.

Note that for all other NAICS with estimates going back to 2012, the explicit condition of leaving the estimate from the fourth quarter of 2012 unchanged created an effective carry-backward factor of 1, leaving all prior estimates unchanged, as well.

Class of Customer and Other Estimates

Similar to revenue, expenses, and inpatient days, the Horvitz-Thompson estimates for other data items from the prior sample were linked to the current sample estimates using a geometric mean involving the item of interest. After applying the geometric mean, a further adjustment may be performed to revise the quarterly estimates from the prior and current samples to ensure appropriate items sum to the quarterly total revenue estimate.

For source of revenue data items, the estimate for a given quarter is multiplied by the corresponding revenue carry-forward factor. This procedure ensures the estimated proportion of revenue by source is preserved after the revenue estimates are revised.

For discharges, no further adjustment is made after the application of the geometric mean.

Revised estimates for aggregate industry levels are obtained by summing the revised estimates for the appropriate detailed industries comprising the aggregate.

Seasonally Adjusted Estimates

New seasonal factors are computed using the revised estimates as input to the Census Bureau's X-13ARIMA-SEATS software, version 1.1 build 59. The new factors are used to produce seasonally adjusted quarterly revenue estimates for all available quarters for the Selected Services Total and select industries. Revised seasonally adjusted estimates reflecting the new

seasonal factors for the Selected Services Total will be available with the February 2022 advance release. Revised seasonally adjusted estimates reflecting the new seasonal factors for select industries will be available with the March 2022 release.

For further information regarding the seasonally adjusted estimates, see our [Frequently Asked Questions](#).

RELIABILITY OF THE ESTIMATES

The published estimates may differ from the actual, but unknown, population values. For a particular estimate, statisticians define this difference as the total error of the estimate. When describing the accuracy of survey results, it is convenient to discuss total error as the sum of sampling error and nonsampling error. Sampling error is the error arising from the use of a sample, rather than a census, to estimate population values. Nonsampling error encompasses all other factors that contribute to the total error of a survey estimate. The sampling error of an estimate can usually be estimated from the sample; whereas, the nonsampling error of an estimate is difficult to measure and can rarely be estimated. Consequently, the actual error in an estimate exceeds the error that can be estimated. Further descriptions of sampling error and nonsampling error are provided in the following sections. Data users should take into account the estimates of sampling error and the potential effects of nonsampling error when using the published estimates.

Sampling Error

Because the estimates are based on a sample, exact agreement with results that would be obtained from a complete enumeration of the sampling frame using the same enumeration procedures is not expected. However, because each firm on the sampling frame has a known probability of being selected into the sample, it is possible to estimate the sampling variability of the survey estimates.

The particular sample used in this survey is one of a large number of samples of the same size that could have been selected using the same design. If all possible samples had been surveyed under the same conditions, an estimate of a population parameter of interest could have been obtained from each sample. For the parameter of interest, estimates derived from the different samples would, in general, differ from each other. Common measures of the variability among these estimates are the sampling variance, the standard error, and the coefficient of variation (CV). The sampling variance is defined as the squared difference, averaged over all possible samples of the same size and design, between the estimator and its average value. The standard error is the square root of the sampling variance. The CV expresses the standard error as a percentage of the estimate to which it refers. For example, an estimate of 200 units that has an estimated standard error of 10 units has an estimated CV of 5 percent. The sampling variance, standard error, and CV of an estimate can be estimated from the selected sample because the sample was selected using probability sampling. We use the random group method (with eight groups or replicates) to estimate sampling variances for the QSS estimates. Note that measures of sampling variability, such as the standard error and CV, are estimated from the sample and are also subject to sampling variability. (Technically, we should refer to the estimated standard error

or the estimated CV of an estimator. However, for the sake of brevity we have omitted this detail.) It is important to note that the standard error and CV only measure sampling variability. They do not measure any systematic biases in the estimates.

The Census Bureau recommends that individuals using published estimates incorporate this information into their analyses, as sampling error could affect the conclusions drawn from these estimates.

The estimate from a particular sample and its associated standard error can be used to construct a confidence interval. A confidence interval is a range about a given estimator that has a specified probability of containing the average of the estimates derived from all possible samples.

Associated with each interval is a percentage of confidence, which is interpreted as follows. If, for each possible sample, an estimate of a population parameter and its approximate standard error were obtained and using a t-statistic with 7 (number of replicates -1) degrees of freedom, then:

1. For approximately 90 percent of the possible samples, the interval from 1.895 standard errors below to 1.895 standard errors above the estimate would include the average of the estimates derived from all possible samples of the same size and design.
2. For approximately 95 percent of the possible samples, the interval from 2.365 standard errors below to 2.365 standard errors above the estimate would include the average of the estimates derived from all possible samples of the same size and design.

To illustrate the computation of a confidence interval for an estimate of total revenue, assume that an estimate of total revenue is \$10,750 million and the CV for this estimate is 1.8 percent, or 0.018. First obtain the standard error of the estimate by multiplying the total revenue estimate by its CV. For this example, multiply \$10,750 million by 0.018. This yields a standard error of \$193.5 million. The upper and lower bounds of the 90-percent confidence interval are computed as \$10,750 million plus or minus 1.895 times \$193.5 million. Consequently, the 90-percent confidence interval is \$10,383 million to \$11,116 million. If corresponding confidence intervals were constructed for all possible samples of the same size and design, approximately 9 out of 10 (90 percent) of these intervals would contain the average of the estimates derived from all possible samples.

Nonsampling Errors

Nonsampling error encompasses all other factors, other than sampling error, that contribute to the total error of a sample survey estimate and may also occur in censuses. It is often helpful to think of nonsampling error as arising from deficiencies or mistakes at some point in the survey process. Nonsampling errors are difficult to measure and can be attributed to many sources: the inclusion of erroneous units in the survey (overcoverage), the exclusion of eligible units from the survey (undercoverage), nonresponse, misreporting, mistakes in recording and coding responses, misinterpretation of questions, and other errors of collection, response, coverage, or processing. Although nonsampling error is not measured directly, the Census Bureau employs quality control procedures throughout the process to minimize this type of error.

A potential source of bias in the estimates is nonresponse. Nonresponse is defined as the inability to obtain all the intended measurements or responses about all selected units. Two types of nonresponse are often distinguished. Unit nonresponse is used to describe the inability to obtain any of the substantive measurements about a sampled unit. In most cases of unit nonresponse, the questionnaire was never returned to the Census Bureau after several attempts to elicit a response. Item nonresponse occurs either when a question is unanswered or the response to the question fails computer or analyst edits.

For both unit and item nonresponse, a missing value is replaced by a predicted value obtained from an appropriate model for nonresponse. This procedure is called imputation and uses survey data and administrative data as input. For current imputation rates, please see the current Quarterly Services Press Release.

DEFINITION OF TERMS

Establishment. A single physical location where business is conducted or services are performed.

Firm. A business organization or entity consisting of one or more domestic establishments/locations under common ownership or control.

Total expenses. (Basic dollar volume measure of expenses for firms exempt from federal income tax.) Costs incurred during the survey year whether or not payments were made in that year. Total expenses include annual payroll; employee benefits, interest, and rent expenses; supplies used for operating; cost of merchandise sold; and other expenses allocated to operations during the year. Also included are contracted or purchased services; fees paid to other organizations for fundraising, depreciation expenses, and expenses of locations providing support services (e.g., repair services, administrative services, etc.) for service establishments. Total expenses exclude outlays for the purchase of real estate (land and buildings); outlays for construction; outlays for additions, major alterations, and improvements to existing facilities; all other capital expenditures; funds invested; income taxes; and assessments (dues) paid to the parent or other chapters of the same organization.

Federal income tax status. Firms that indicate all or part of their income are exempt from federal income tax under provision of Sections 501 or 521 of the Internal Revenue Service are classified as tax-exempt. Firms indicating no such exemption are classified as taxable. For all firms, the tax status classification is based upon administrative records.

Total operating expenses. Costs incurred during the survey year, even though payment may be made at a later date. Excludes interest on loans and sales taxes and other taxes collected from customers and paid directly to a taxing authority.

Total operating revenue. Includes charges or billings for services rendered and any sales of merchandise during the survey year, even though payments may be received at a later date. Excludes income from interest, investments, gifts, loans, contributions, or grants; the sale of securities, real estate, etc; sales taxes or other taxes collected from customers and remitted

directly by the firm to a local, state, or federal tax agency; revenue from the sale of merchandise and equipment from retail establishments; and revenue from a domestic parent organization, or from franchise locations owned by others and any franchise or license fees.

Total revenue. (Basic dollar volume measure for firms exempt from federal income tax.)

Charges or billings to customers or clients for services rendered and merchandise sold during the survey year whether or not payment was received in that year. Also includes income from interest, dividends, contributions, gifts and grants, rents, royalties, dues and assessments from members and affiliates, and net receipts from fundraising activities. Receipts from taxable business activities, as well as tax-exempt activities are included.

Excludes sales taxes or other taxes (real estate, admissions, etc.) collected by the organization from customers or clients and paid directly to local, state, or federal income tax agencies; income from the sale of real estate, investments, or other assets; or amounts transferred to operating funds from capital or reserve funds. Firms providing legal services report payments received in the survey year regardless of when services are rendered.

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